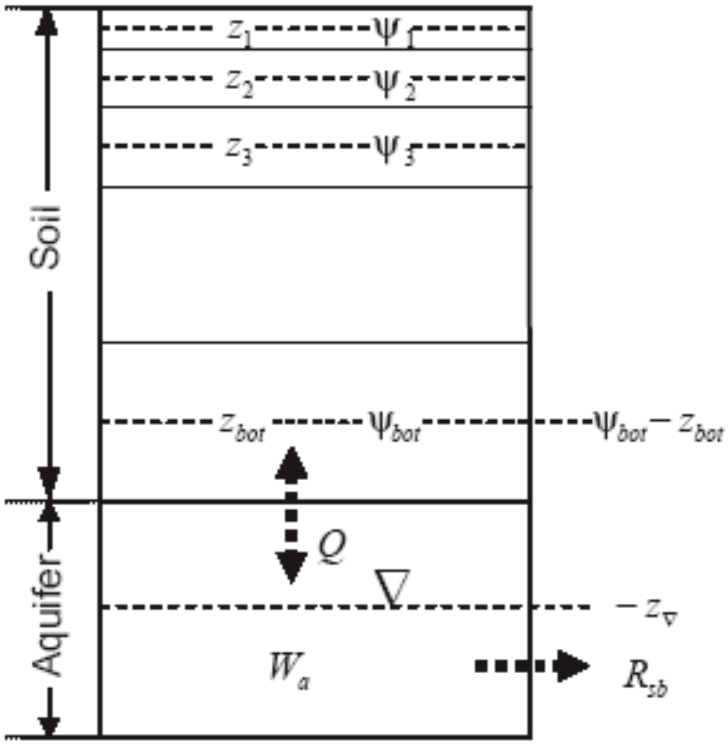

Figure 1. Schematic diagram of the soil layers and an unconfined aquifer. The depth to water table is represented by z_∇. The recharge rate, *Q*, is proportional to the difference between the water head at the bottom layer ($\psi_{bot} - z_{bot}$) and that at the water table ($-z_\nabla$).

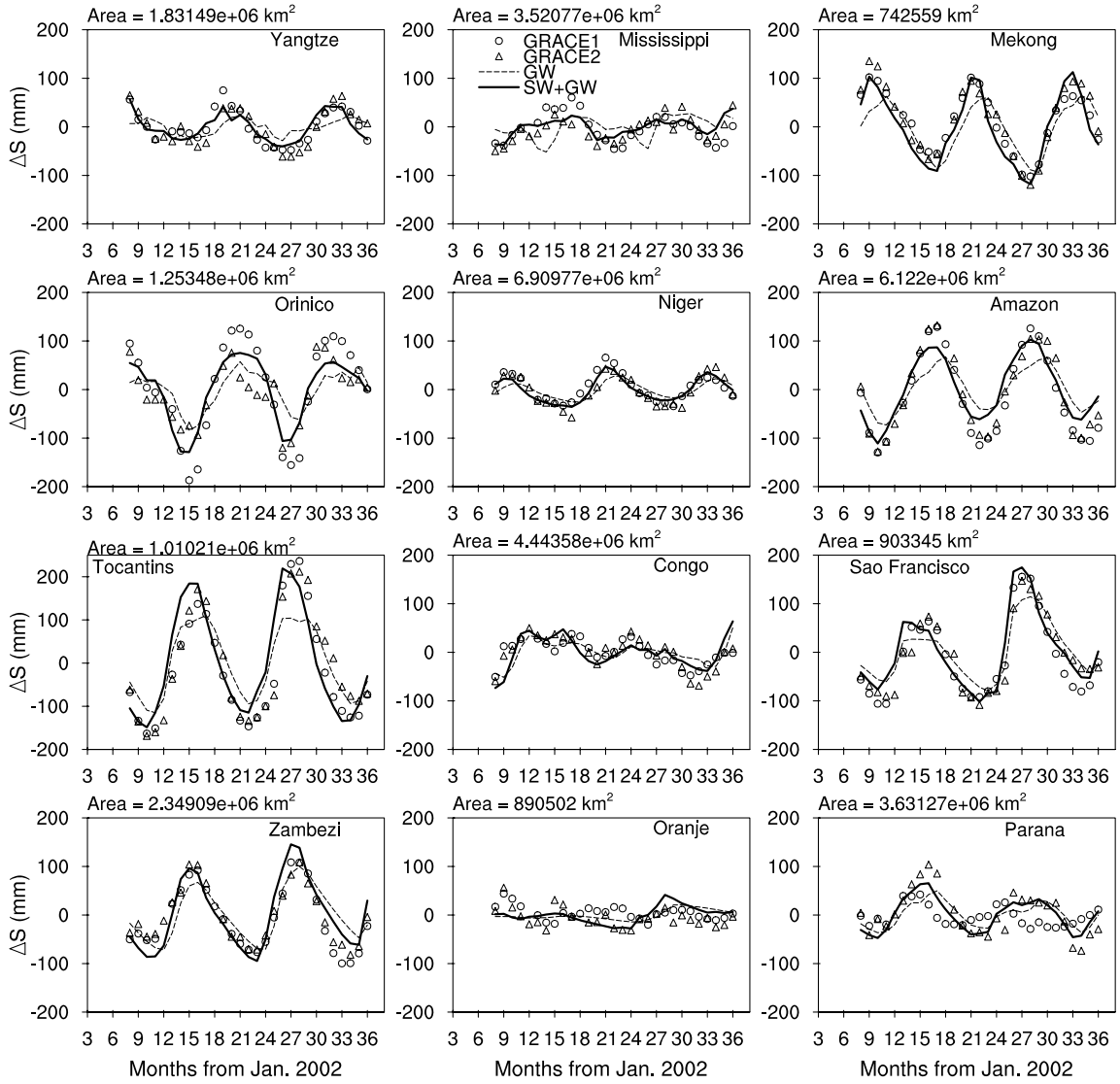

Figure 2. Modeled river-basin averaged anomalies of the total water storage (unsaturated soil water + groundwater: SW+GW, except for Mississippi, where snow water is also included) and groundwater storage (GW) in comparison with GRACE water storage anomaly.

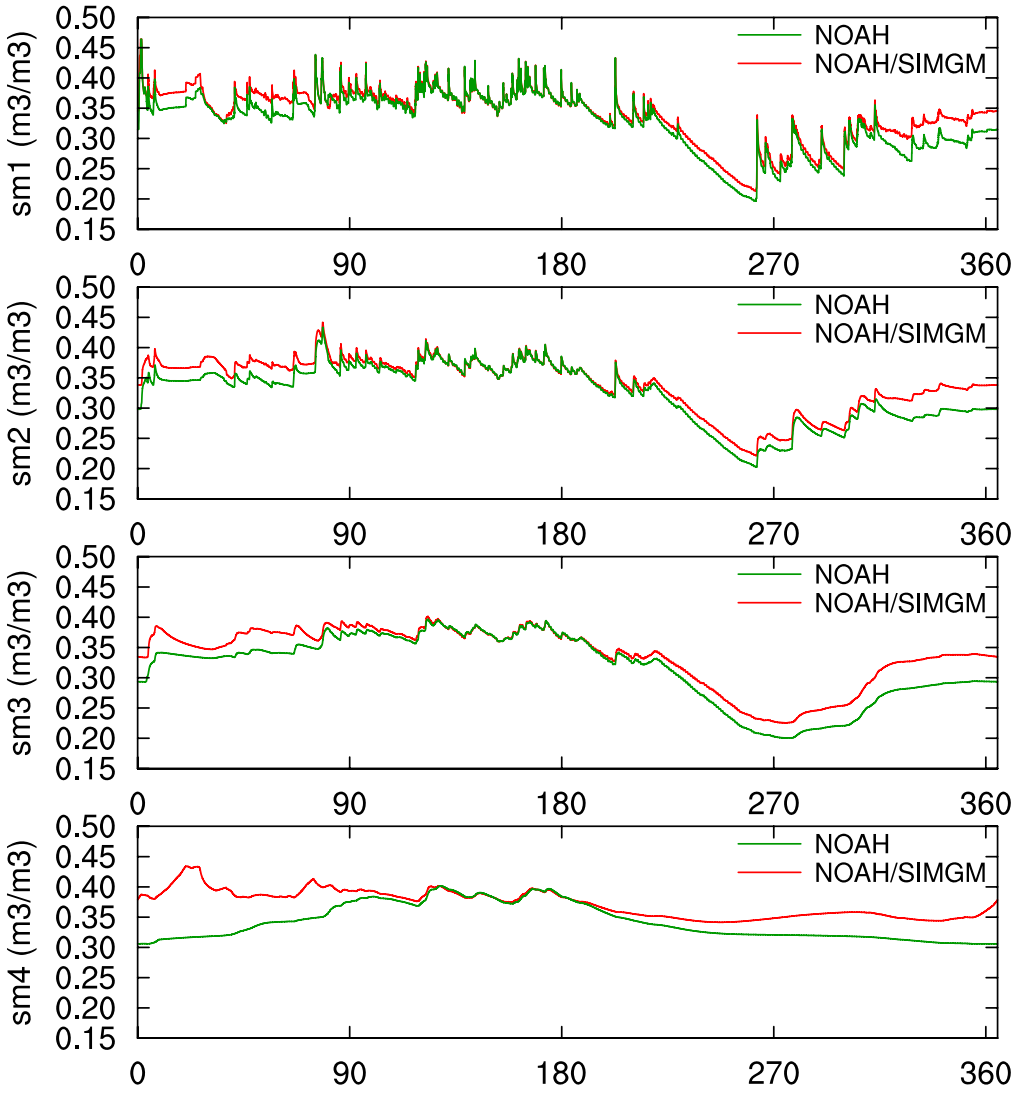

Figure 3. Modeled soil moisture in four soil layers (0.1, 0.3, 0.6, and 1.0m) by Noah without and with SIMGM.

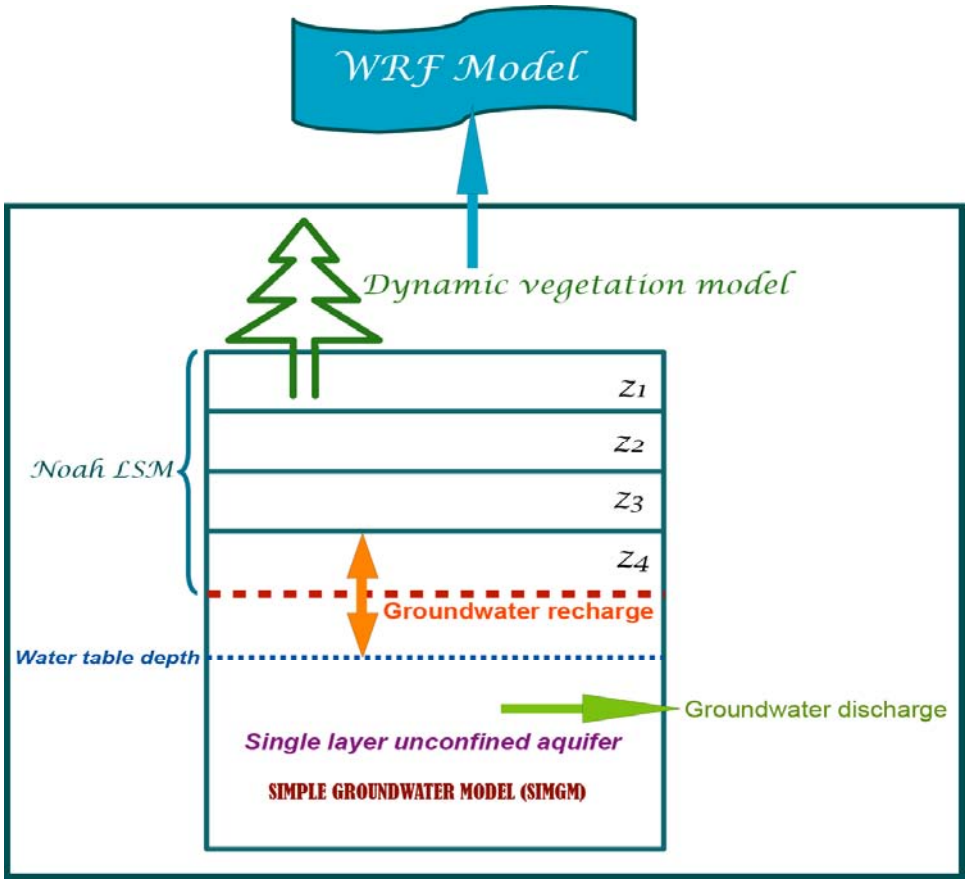

Figure 4. Noah LSM coupled with a dynamic vegetation and groundwater components

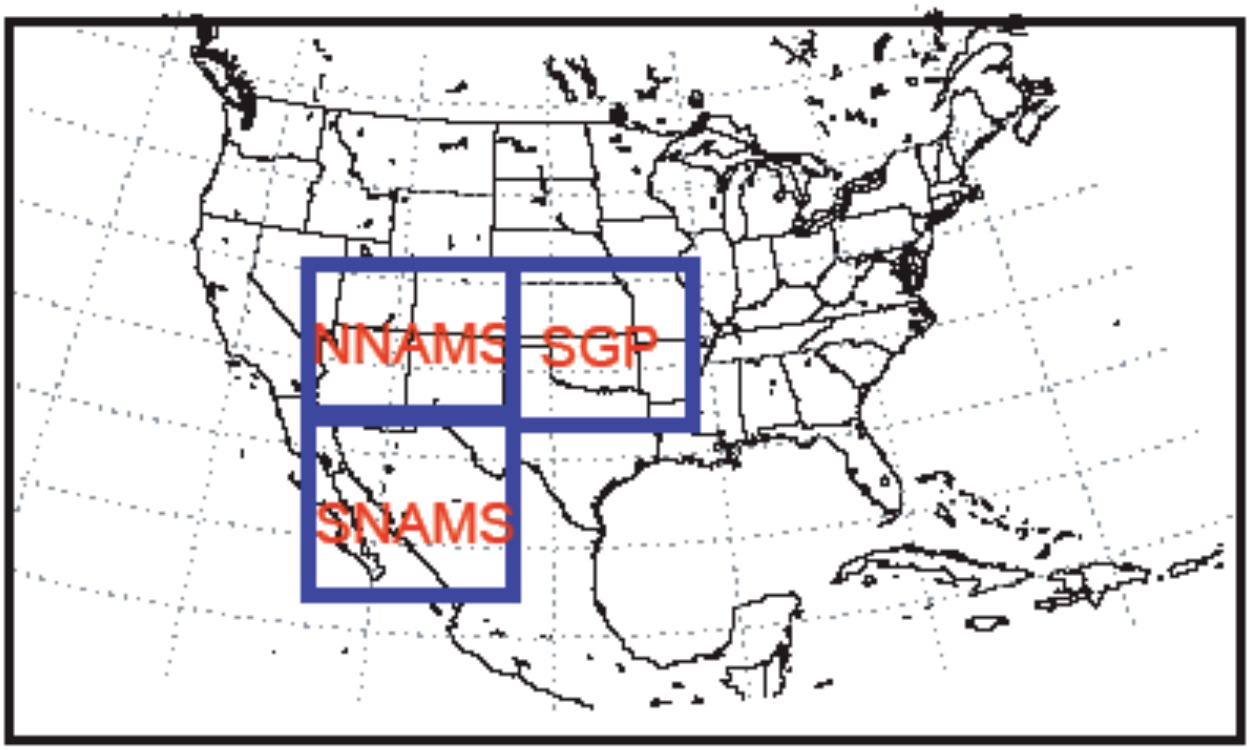

Figure 5. Model domain

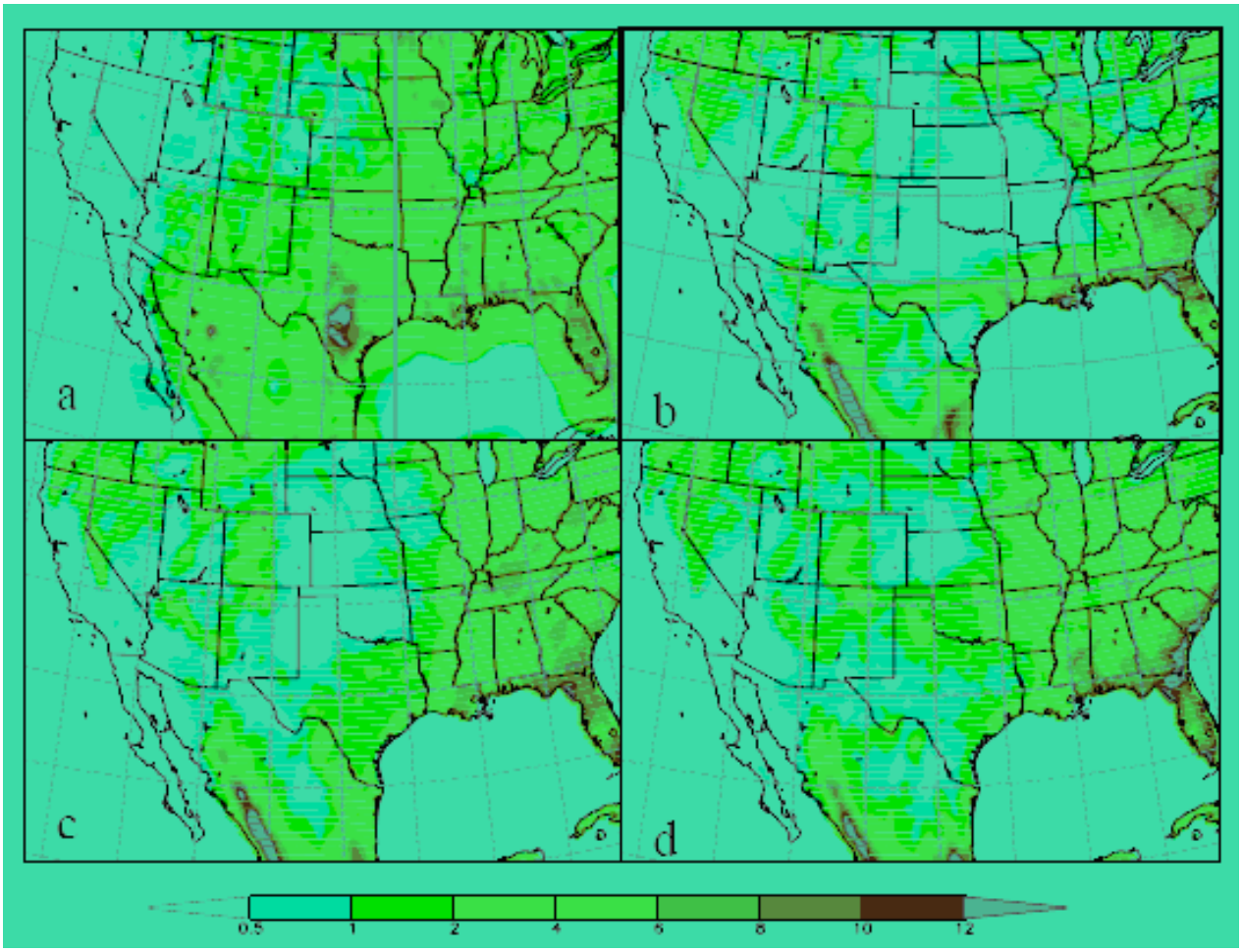

Figure 6. Precipitation (mm/day) in July 2002. (a) Observations, (b) WRF with the standard Noah LSM (FIX) (c) As (b) but including an interactive vegetation canopy (DV) and (d) As (c) but including a groundwater component (GWDV).

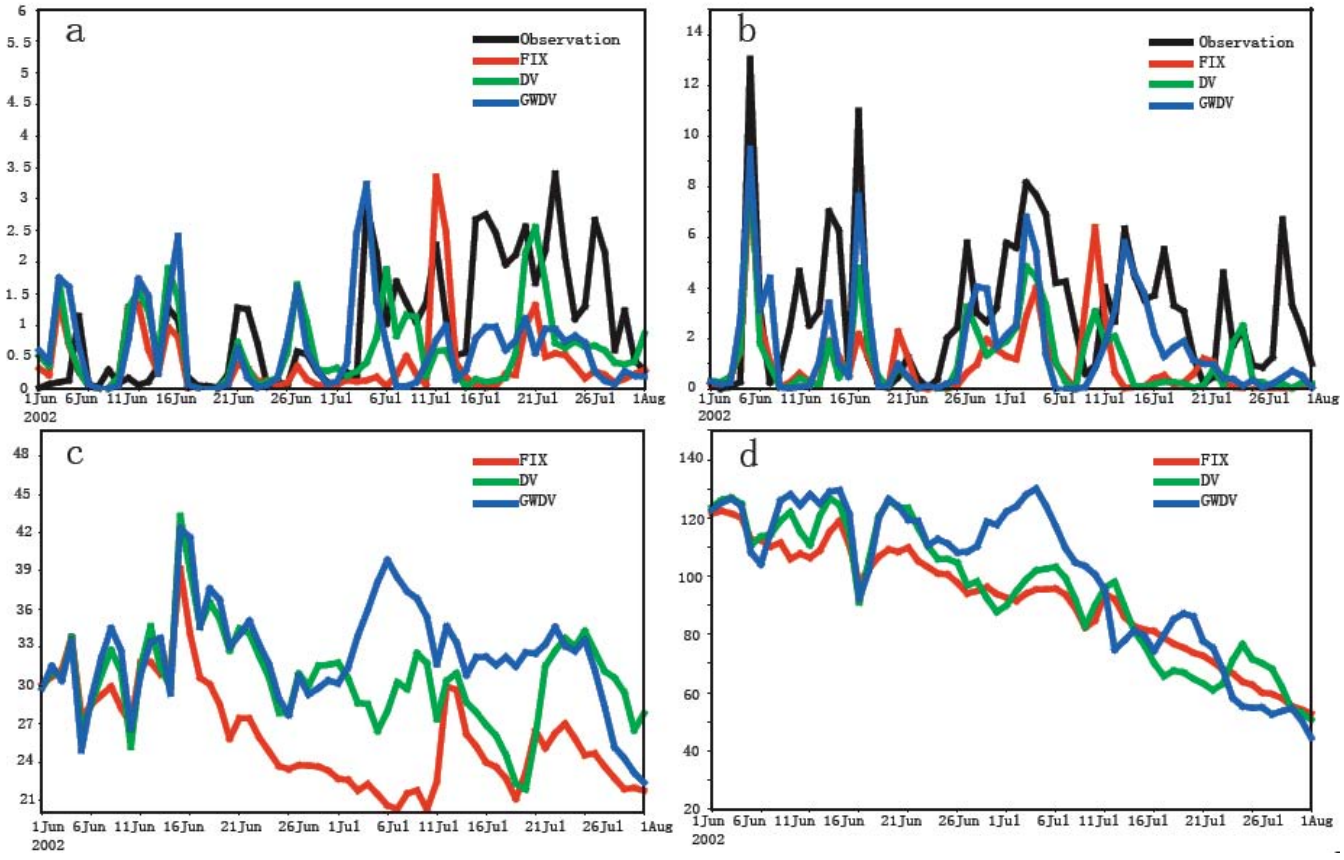

Figure 7. Time series of daily precipitation (P) mm and latent heat flux (LH) W/m^2
(a. P for NNAMS, b. P for SGP, c. LH for NNAMS, d. LH for SGP)